

Claims

I claim:

1 1. A method for determining a with-distance relationship between a first geometry object
2 and a second geometry object, the method comprising:
3 defining an exterior approximation of the first geometry and the second geometry;
4 computing a maximum distance between the exterior approximations; and
5 comparing the computed maximum distance with a first predetermined distance to
6 determine whether the second geometry satisfies a first filter condition with respect to the first
7 geometry.

1 2. The method according to claim 1, further comprising:
2 defining an interior approximation of the first geometry;
3 expanding the interior approximation by a second predetermined distance; and
4 comparing the expanded interior approximation with the second geometry to determine if
5 the second geometry satisfies the first filter condition with respect to the first geometry.

1 3. The method according to claim 2, wherein the first filter condition is satisfied if the
2 second geometry is inside the expanded interior.

1 4. The method according to claim 2, wherein the interior approximations comprise
2 interior tiles, interior circles or minimum bounding rectangles.

1 5. The method according to claim 1, wherein computing the maximum distance between
2 exterior approximations comprises:
3 computing the distance.

1 6. The method according to claim 5, further comprising:
2 computing a circle that circumscribes the minimum bounding rectangle; and
3 comparing the circle with the second geometry to determine if the second geometry
4 satisfies the first filter condition with respect to the first geometry.

1 7. The method according to claim 2, wherein defining the approximation of the first
2 geometry comprises:
3 identifying a center of the first geometry;
4 identifying a minimum distance from the center to a boundary of the first geometry; and
5 defining a circle having the minimum distance as its radius and the center of the first
6 geometry as its center;
7 wherein determining whether the second geometry satisfies a first filter condition with
8 respect to the first geometry comprises comparing the circle with a second geometry.

1 8. The method according to claim 7, wherein defining the approximation of the first
2 geometry further comprises:
3 identifying a maximum span line of the first geometry;
4 identifying a minimum distance from a plurality of points along the maximum span line

5 to a boundary of the first geometry; and
6 defining about each of the plurality of points a circle having the minimum distance as its
7 radius;
8 wherein determining whether the second geometry satisfies a first filter condition with
9 respect to the first geometry comprises comparing each circle with a second geometry.

1 9. The method according to claim 7, wherein a circle is defined about eleven points
2 equidistantly spaced along the maximum span line.

1 10. The method according to claim 7, wherein a circle is defined about eleven positions
2 along the maximum span line.

1 11. The method according to claim 2, wherein each circle is entirely contained within the
2 first geometry.

1 12. The method according to claim 7, wherein the first filter condition comprises the
2 second geometry lies entirely within one of the circles.

1 13. The method according to claim 1, wherein defining the exterior approximation
2 comprises:
3 defining a minimum bounding rectangle.

1 14. The method according to claim 7, wherein the center is a centroid.

1 15. The method according to claim 1, wherein the first geometry and the second
2 geometry are described by geodetic data.

1 16. The method according to claim 1, wherein the first geometry and the second
2 geometry are described by non-geodetic data.

1 17. The method according to claim 2, wherein the interior approximation comprises at
2 least one tile.

1 18. The method according to claim 1, wherein the first geometry and the second
2 geometry comprise objects represented in a database organized in an R-tree hierarchy or variant
3 of an R-tree.

1 19. A method for determining a with-distance relationship between a first geometry
2 object and a second geometry object, the method comprising:
3 defining an interior approximation of a first geometry;
4 expanding the interior approximation by a second predetermined distance; and
5 comparing the expanded interior approximation with a second geometry to determine if
6 the second geometry satisfies the first filter condition with respect to the first geometry.

1 20. A computer program product for performing a process of determining relationships
2 among objects represented in a database, comprising:

3 a computer readable medium; and
4 computer program instructions, recorded on the computer readable medium, executable
5 by a processor, for performing the steps of:
6 defining an exterior approximation of the first geometry and the second geometry;
7 computing a distance between the exterior approximations; and
8 comparing the computed distance with a first predetermined distance to determine
9 whether the second geometry satisfies a first filter condition with respect to the first geometry.

1 21. The computer program product according to claim 20, wherein the computer program
2 instructions are further for performing the steps of:
3 defining an interior approximation of the first geometry;
4 expanding the interior approximation by a second predetermined distance; and
5 comparing the expanded interior approximation with the second geometry to determine if
6 the second geometry satisfies the first filter condition with respect to the first geometry.

1 22. A system for performing a process of determining relationships among objects
2 represented in a database, comprising:
3 a processor operable to execute computer program instructions; and
4 a memory operable to store computer program instructions executable by the processor,
5 for performing the steps of:
6 defining an exterior approximation of the first geometry and the second geometry;
7 computing a distance between the exterior approximations; and
8 comparing the computed distance with a first predetermined distance to determine.

9 whether the second geometry satisfies a first filter condition with respect to the first geometry.

1 23. The system according to claim 22, wherein the computer program instructions are
2 further for performing the steps of:

3 defining an interior approximation of the first geometry;

4 expanding the interior approximation by a second predetermined distance; and

5 comparing the expanded interior approximation with the second geometry to determine if
6 the second geometry satisfies the first filter condition with respect to the first geometry.